

Claims

1. A multi cylinder thick materials pump (1) for providing concrete in particular, whose at least two feeding cylinders (3, 5) feed the thick material from a pre filling container (7) into a feed line, having a shift valve (9) for alternatively connecting the feeding cylinders with the feed line associated with it, comprising at least two moveable valve bodies (15, 17; 15', 17'; 15'', 17''), each comprising a transfer section (15L, 17L) between each one of the feeding cylinders and the feed line, connected downstream of the feeding cylinders to a collector tube (19),
characterized in, that the shift valve (9) comprises at least one, but preferably two substantially rotationally movable rotating slides (15, 17; 15', 17'; 15'', 17''), each of them comprising a straight transfer section (15L, 17L), for connecting the respectively associated feeding cylinder (3, 5) with the feed line, and a section blocking the connection.
2. Thick materials pump according to claim 1,
characterized in, that the shift valve (9) comprises a guidance structure (11) for the rotating slides (15, 17; 15', 17'; 15'', 17''), having openings for passing through thick materials flows.
3. Thick materials pump according to claim 2,
characterized in, that the guidance structure (11) is mounted to the prefilling container (7) in a fixed manner, so that the rotating slides (15, 17; 15', 17'; 15'', 17'') and their inlet openings are always in contact with the thick material filled in.
4. Thick materials pump according to claims 2 or 3,
characterized in that the guidance structure (11) is substantially provided shaped as a box or as a frame, comprising a solid, in particular two sided axial bearing (15A, 17A) for each rotating slide (15, 17; 15', 17'; 15'', 17'').

5. A thick materials pump according to one of the preceding claims, **characterized in, that** the rotating slides (15, 17; 15', 17'; 15'', 17'') can be positioned within the guidance structure (11) through pivoting around a rotation axis (15A, 17A) into at least two different positions, thus a transfer position, wherein the feeding cylinder can eject into the collector tube (19), and a blocking- or inlet position wherein the feeding cylinder can suck thick material out of the pre filling container (7).

6. A thick materials pump according to one of the preceding claims, **characterized in, that** the rotating slides (15, 17; 15', 17'; 15'', 17'') are made identically or as mirror images of each other.

7. A thick materials pump according to claim 5 or 6, **characterized in, that** the rotating slides (15, 17; 15', 17'; 15'', 17'') are drum shaped and are held in their guidance structure (11) on both sides, so they can rotate.

8. A thick materials pump according to one of the preceding claims, **characterized in, that** a rotating slide (15, 17; 15', 17'; 15'', 17'') is divided into at least three sections along its circumference, one of them being the transfer section (15L, 17L) and one of them being the inlet section (15E, 17E).

9. A thick materials pump according to claim 8, **characterized in, that** the inlet section (15E, 17E), comprises an open inlet, radially oriented relative to the rotation axis (15A, 17A) of the rotating slide and an exhaust parallel to said rotating axis, facing towards the feeding cylinder.

10. A thick materials pump according to claim 8 or 9, **characterized in, that** in the inlet section (15E, 17E) of the rotating slide a deflection device (15S, 17S) is provided.

11. A thick materials pump according to claim 8 or 9 or 10, **characterized in, that** between the transfer section and the intake section a blocking section (15B, 17B) without through flow function is provided.

12. A thick materials pump according to one of the claims 8 through 11, **characterized in, that** the sections of the rotating slide are located on a joint partial circle (15T, 17T) with distances evenly spaced relative to each other.

13. A thick materials pump according to claim 7 or 8, **characterized in, that** the sections of the rotating slides (15, 17; 15', 17'; 15'', 17'') are provided as single modules and in particular connected to each other so, they can be disconnected.

14. Thick materials pump according to one of the claims 8 through 13, **characterized in, that** the rotating slides (15'', 17'') are divided into six sections, two of them transfer sections, (15L, 17L), two inlet sections (15E, 17E), and two blocking sections (15B, 17B).

15. Thick materials pump according to one of the claims 8 through 13, **characterized in, that** the rotating slides (15'', 17'') are divided into four sections, one transfer section, (15L, 17L), one inlet section (15E, 17E), and two blocking sections (15B, 17B)

16. Thick materials pump according to one of the preceding claims, **characterized in, that** it comprises at least one flap (13) for removing thick material from the transfer section (15L, 17L) of a rotating slide (15, 17; 15', 17'; 15'', 17'').

17. Thick materials pump according to claim 16, **characterized in, that** a common flap is provided for several rotating slides (15, 17; 15', 17'; 15'', 17'').

18. Thick materials pump according to one of the preceding claims, **characterized in, that** the rotating slides (15, 17; 15', 17'; 15'', 17'') are independently driveable and positionable, in particular through hydraulic lifting cylinders.

19. Thick materials pump according to claim 18, **characterized in, that** the drive for the rotating slide comprises crank drive, driving the rotation axis of the rotating slide and driveable by a lifting cylinder.

20. Thick materials pump according to claim 18, **characterized in, that** a sling drive is provided, operating around the rotation axis of the rotating slide (15, 17; 15', 17'; 15'', 17'').

21. Thick materials pump according to one of the preceding claims **characterized in, that** the transfer section (15L, 17L) of the rotating slide (15, 17; 15', 17'; 15'', 17'') comprises a cylindrical tube with the same diameter as the feeding cylinders.

22. Thick materials pump according to one of the preceding claims, **characterized in, that** it comprises a control unit, to which the momentary positions of the shift valve and the rotating slides as well as of the feed pistons of the feeding cylinders are provided by position indicators and which controls the drives of the rotating slides and of the feeding pistons according to a predetermined time distance pattern in a cyclical manner.

23. A process for operating a thick materials pump, in particular a thick materials pump (1) according to one of the preceding claims, for continuous feeding, the thick materials pump comprising at least two open feeding cylinders (3, 5) with feeding pistons (K3, K5) and a shift valve (9) with independently controllable rotating slides (15, 17; 15', 17'; 15'', 17''), comprising at least one transfer section (15L, 17L) for connecting an associated feeding cylinder with a feed line and an intake section (15E, 17E) for sucking in thick material from a pre filling container (7) through the associated feeding cylinder (3, 5), wherein a synchronous travel phase of the feed-

ing pistons (K3, K5) is controlled in a cyclic manner, while its at least two rotating slides (15, 17; 15', 17'; 15'', 17'') are located in a transfer position, wherein its transfer sections (15L, 17L) connect the associated feeding cylinders to the feed line for preliminary simultaneous expulsion of thick material.

24. A process according to claim 23, wherein the feeding pistons (K3, K5) are controlled in a manner in the synchronous phase whereby they are adjusted to each other, so that the thick materials quantity pumped by them simultaneously is approximately equal to feeding through one piston (K5 or K3) alone, during the suction stroke of the respective other piston (K3 or K5).

25. A process according to claim 23 or 24, wherein at the beginning of the pump stroke of each feeding piston (K3, K5) of each feeding cylinder (3, 5) its opening is momentarily closed through the blocking section (15B, 17B) of the rotating slides and this piston performs a pre compression stroke.

26. A process according to claim 25,
characterized in, that each pump stroke of a piston comprises at least a pre compression phase (phases 4 / 8), a first synchronous phase (phases 1 / 5) a pump phase (phases 2 to 4 / 6 to 8) and a second synchronous phase (phase 5 / 1).

27. A process according to one of the preceding process claims,
characterized in, that during the synchronous phase both feeding pistons (K3, K5) are driven at the same speed, in particular at half the normal speed of their further pump stroke.

28. A process according to one of the preceding claims,
characterized in, that upon a pump stroke a transition phase (phase 2 / 6) with a stand still of a feeding piston during a continuing pump stroke of the other feeding piston follows.

29. A process according to one of the preceding process claims,
characterized in, that, the suction stroke of each piston (phase 3 / 7) is faster than its pump stroke, in particular is included between a transition phase (phase 2 / 6) and a pre compression phase (phase 4 / 8).

30. A process according to claim 29,
characterized in, that each suction stroke of a piston comprises a start ramp and a stop ramp with reduced speed.

31. A process according to one of the preceding process claims,
characterized in, that the rotating slides (15, 17; 15', 17'; 15'', 17'') are slowed down, or stopped momentarily during the synchronous phases.

32. A process according to one of the preceding process claims,
characterized in, that the rotating slides (15, 17; 15', 17'; 15'', 17'') are slowed down or stopped momentarily during a pre compression phase.

33. A process according to one of the preceding process claims,
characterized in, that the rotating slides (15, 17; 15', 17'; 15'', 17'') are slowed down, or stopped momentarily during a transition phase.

34. A process according to one of the preceding process claims,
characterized in, that the rotating slides (15, 17; 15', 17'; 15'', 17'') are slowed down or stopped momentarily during a suction phase.

35. A process according to one of the preceding process claims,
characterized in that the rotating slides (15, 17; 15', 17'; 15'', 17'') are positioned in an operating position in the operational pauses of the thick materials pump, allowing the removal of remaining thick material and the insertion of a cleaning body when required.

36. A process according claim 35,
characterized in, that the operational position is the inlet position of the rotating slide.

37. A process according to claim 35 or 36, **characterized in, that**
a safety device for preventing the starting of the rotating slide is activated during the removal and/or insertion process.

Summary

Piston Pump for Thick Materials

In a multi cylinder thick materials pump (1) for feeding concrete in particular, whose at least two feeding cylinders (3, 5) feed the thick material from a pre filling container (7) into a feed line, and a shift valve (9) for alternatively connecting the feeding cylinders, having a feed line associated with it, comprising at least two rotationally movable valve bodies, each comprising a straight transfer section (15L, 17L) between each one of the feeding cylinders and the feed line, connected downstream of the feeding cylinders to a collector tube (19), the shift valve (9) according to the invention comprising at least one, but preferably two rotationally movable rotating slides (15, 17; 15', 17'; 15'', 17''), each of them comprising a straight transfer section (15L, 17L) for connecting the feeding cylinder respectively associated with it to the feed line, and at least one section blocking the connection. Also a process for operating of this thick materials pump for continuous feeding is described.